Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2018-315-AC1, 2019

Geoscientific Model Development Discussions

Interactive comment on "Surrogate-assisted Bayesian inversion for landscape and basin evolution models" *by* Rohitash Chandra et al.

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Received and published: 19 June 2019

It seems that the reviewer has has failed to understand that parallel tempering MCMC is a methodology for implementing Bayesian inference. The reviewer needs to review MCMC methods and will find that parallel tempering is a well established method that has been widely used for inversion problems in Earth science. Furthermore, it is widely used in areas of physics, such as astrophysics, environmental modelling and many other areas that have inversion problems. A simple search in google scholar will help.

One of the key researchers in this area is Malcolm Sambridge from ANU who has more recently used parallel tempering MCMC (Bayesian method) for inversion problems in Earth Sciences!

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Discussion paper

Malcolm Sambridge, A Parallel Tempering algorithm for probabilistic sampling and multimodal optimization Geophysical Journal International, Volume 196, Issue 1, January, 2014, Pages 357–374, https://doi.org/10.1093/gji/ggt342

Dosso SE1, Holland CW, Sambridge M., Parallel tempering for strongly nonlinear geoacoustic inversion. J Acoust Soc Am. 2012 Nov;132(5):3030-40. doi: 10.1121/1.4757639.

M. Sambridge, "A Parallel Tempering algorithm for probabilistic sampling and multimodal optimization," in Geophysical Journal International, vol. 196, no. 1, pp. 357-374, Jan. 2014. doi: 10.1093/gji/ggt342 URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8179653&isnumber=8179647

Furthermore, the reviewer has undermined the novelty of this work, which is particularly intended for computationally expensive model optimisation (inference). The contribution of the paper is not in improving parallel tempering MCMC but in applying it for landscape evolution problems and further to use surrogate assisted methods for further improving computational efficiency.

Latest MCMC methods such as Hamiltonian MCMC and Langevin based MCMC methods cannot be applied to this problem since there is no gradient information. This is major reason parallel tempering MCMC with random-walk proposals has been used.

The paper not only formulates the concept, but also implements and releases open source software that can help the landscape evolution modelling committee.

We note that there are related journals that could publish the paper with but the authors found this journal to be most suitable. The authors strongly rejects the biased review comments of the reviewer that shows lack of understanding in basic concepts in Bayesian inference. Hence, the reviewers calls for review process to consider those who know about MCMC methods with applications to Earth science models!

2019.